

Shock Generation and Control Using DBD Plasma Actuators, Phase I

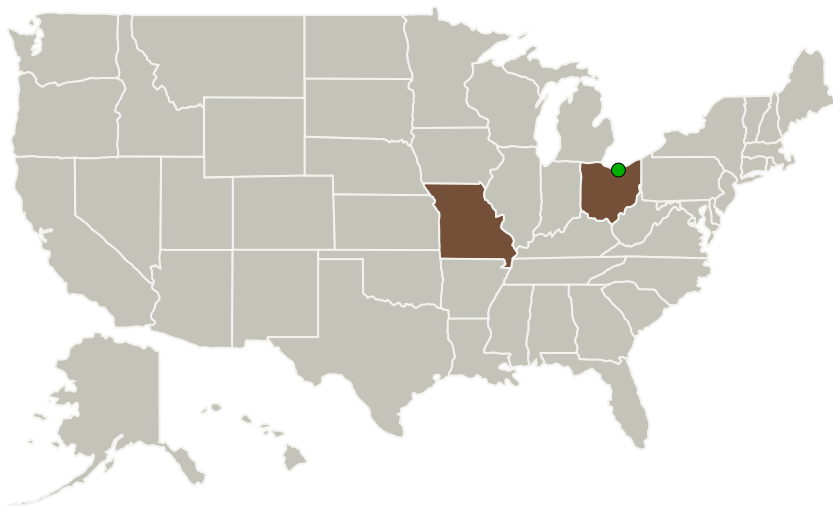


Completed Technology Project (2011 - 2011)

Project Introduction

Shock-wave/boundary-layer interactions (SWBLI) pose challenges to aeronautical engineers because they create regions of adverse pressure gradients as a result of the discontinuous change in conditions across the shock. This shock-induced pressure gradient is a common factor for both flow separation in supersonic inlets and high stagnation pressure losses on transonic wings, factors which are known to reduce performance and efficiency. These effects can be corrected with appropriate forms of flow control. Innovative Technology Applications Company (ITAC) and University of Notre Dame (UND) propose the use of electrohydrodynamic (EHD) plasma actuators to control the affects of SWBLIs for two types of problems, one involving boundary layer separation and the other transonic wave drag. We propose to use plasma actuators near the region of the SWBLI to eliminate or delay the onset of separation in supersonic inlets while using plasma-based shock control methods to reduce the stagnation pressure losses on transonic airfoils. The advantages of the dielectric barrier discharge (DBD) actuators are that they are fully electronic, contain no moving parts, surface mountable, minimally intrusive, can be turned off when not needed, and electrically re-configurable for optimal control in dynamic flow conditions.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Innovative Technology Applications Co.	Lead Organization	Industry	Chesterfield, Missouri
● Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations

Missouri	Ohio
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Project Transitions

**February 2011:** Project Start**September 2011:** Closed out**Closeout Documentation:**

- Final Summary Chart(<https://techport.nasa.gov/file/138496>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Innovative Technology Applications Co.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Mehul P Patel

Co-Investigator:

Mehul M Patel

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Technology Maturity (TRL)

Start: **2**
Current: **4**
Estimated End: **4**



Technology Areas

Primary:

- TX15 Flight Vehicle Systems
 - └ TX15.1 Aerosciences
 - └ TX15.1.5 Propulsion Flowpath and Interactions

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System